



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

MEMORANDUM

SUBJECT: Five-Year Review for the Monolithic Memories (aka Advanced Micro Devices - Arques) Superfund Site, Santa Clara, CA

FROM: Tom Kremer, Superfund Policy Advisor *TA Kremer*
Site Cleanup Branch

THRU: John Kemmerer, Chief *John Kemmerer*
Site Cleanup Branch

TO: Keith Takata, Director
Superfund Division

I. INTRODUCTION

Attached, please find a copy of the first Five-Year Review for the subject Superfund Site prepared by the California Regional Water Quality Control Board, San Francisco Bay Region. EPA has reviewed their Five-Year Review and adopts their recommendations as written. The Board's Five-Year Review is summarized below.

Because contaminant levels will allow for unlimited use and unrestricted exposure upon achieving ROD cleanup goals, this Five-Year Review is not required by CERCLA (Section 121©) or by Section 300.430(f)(4)(ii) of the NCP. However, because cleanup will take five years or more to attain, this Five-Year Review must be conducted as a matter of Agency policy (OSWER Directive 9355.7-02, "Structure and Components of Five-Year Reviews", 5/31/91. This review (Type 1) is applicable to sites at which construction is complete (OSWER Directive 9355.7-02A, "Supplemental Five-Year Review Guidance", 7/26/94.

II. FIVE-YEAR REVIEW SUMMARY

The Monolithic Memories site is located at 1165 Arques Avenue in Santa Clara. Investigations at the site beginning in 1982 indicated that soil and ground water had become contaminated with VOCs, primarily TCE, PCE, and DCE. The sources were identified as solvent tanks and acid waste neutralization systems; these were removed from the site between 1983 and 1985. EPA proposed listing the site on the National Priority List in 1984 and finalized the listing in 1987.

The ROD set soil and ground water cleanup standards for the site, required operation of a soil vapor extraction system, and required on- and off-site ground water extraction and treatment.

Advanced Micro Devices has implemented the required remedial actions, operating on- and off- site ground water extraction and treatment (jointly with National Semiconductor Corporation, whose ground water plume has commingled with that of the subject site) and on-site soil vapor extraction systems. SVE systems at have been effective in removing VOCs from the unsaturated zone, and continue to operate. Ground water systems have been effective in containing the plume and reducing concentrations of contaminants in ground water, and continue to operate. No exposure to contaminated groundwater is occurring or expected. Institutional controls have been in place since 1993. The most recent site inspection by Regional Board staff took place on 10/9/98. Full achievement of cleanup standards remains years away.

III CONCLUSION

I certify that the remedy selected for this site remains protective of human health and the environment. Based on the expected continuing presence of contamination at this site at levels which preclude unlimited use and unrestricted exposure, the next Five-Year Review will be written by 8/22/2004.

Approved by: Keith Taka —
Keith Takata, Director
Superfund Division

Date: 9-29-99

Attachment: California Regional Water Quality control Board 5-Year Review for

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

INTERNAL MEMO

TO: Loretta K. Barsamian
Executive Officer

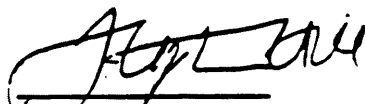
Date: December 4, 1996

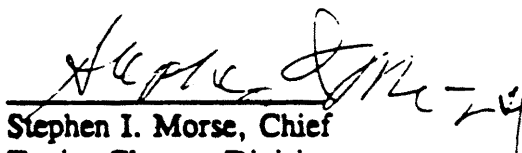
FROM: Cecilio Felix
Assoc. Engineering Geologist

Signature: 

SUBJECT: Review Comments on Five-Year Status Reports and Effectiveness Evaluations for National Semiconductor Corporation (2900 Semiconductor Drive, Santa Clara) and Advanced Micro Devices (1165 East Arques Avenue, Sunnyvale), Santa Clara County

CONCUR:


Stephen A. Hill
Section Leader


Stephen I. Morse, Chief
Toxics Cleanup Division

National Semiconductor Corporation (NSC) and Advanced Micro Devices (AMD) have submitted their first Five-Year Status Report and Effectiveness Evaluations for their respective sites. The sites have been used to manufacture semiconductor components and circuit boards. Groundwater contamination was detected at the sites in the early 1980s; investigation and interim remediation was initiated in the early to mid 1980s. Final Cleanup Plans adopted for the sites in September 1991 and have been implemented. Based on the data provided in the five year status reports, VOC migration is being controlled.

As with other similar sites, reductions in VOC concentrations have been made in some areas, while in other areas, concentrations remain high. Both NSC and AMD are uncertain whether the groundwater cleanup goals can be achieved within a reasonable time. However, both NSC and AMD propose to continue implementation of the current groundwater pump and treat measures. No measures have been identified which would enhance the performance of the existing measures. The dischargers may propose alternative cleanup goals in the future.

Although remedial measures were expanded approximately 60%, NSC was able to complete vadose zone soil cleanup at only 7 of the 12 source areas. This is due to the fact that

investigations revealed additional areas requiring soil cleanup. SVE systems are operational at the remaining five source areas. Soil cleanup goals have been met at all three source areas at the AMD site.

In its five year report, AMD restates its position that: 1) groundwater cleanup at the AMD site is prolonged and more costly due to migration of VOCs from the NSC site; and 2) contaminants released at the AMD site did not migrate vertically into the B-aquifer. AMD bases its position on groundwater monitoring data, pump test data, and the lack of conclusive evidence that the subunit 1 groundwater extraction system provides sufficient capture of VOCs originating at the NSC site. AMD's arguments are fundamentally cost allocation issues which are best left to the dischargers to resolve. Board staff recommend no modifications to the existing final cleanup plan. AMD is attempting to resolve these issues directly with NSC, but may reactivate its request for Board reconsideration if these efforts fail.

I recommend that the five year review reports be accepted by the Board. I also recommend that the current groundwater remedial measures be continued by NSC and AMD, and that the soil remediation continue at the 5 remaining NSC source areas. The attachments provide an overview of each five year report. We will forward the attachments to EPA Region 9 following the Board meeting.

Attachments

**U.S. Environmental Protection Agency
Region IX
Hazardous Waste Division
Five-Year Review (Type I)
Advanced Micro Devices
(Formerly Monolithic Memories)
1165 Arques Avenue
Sunnyvale, California**

I. Introduction

Authority Statement and Purpose. EPA Region IX conducted this review pursuant to CERCLA section 121(c), NCP section 300.400(f)(4)(ii), and OSWER Directives 9355.7-02 (May 23, 1991) and 9355.7-02 (July 26, 1994). It is a policy review. The purpose of a five-year review is to ensure that a remedial action remains protective of public health and the environment and is functioning as designed. This document will become a part of the Site File. This review (Type I) is applicable to a site at which response is ongoing.

Site Characteristics. Advanced Micro Devices (AMD) is a federal Superfund site in the South Bay, overseen by the Board under an agreement with the U.S. EPA. In accordance with its 1991 site cleanup requirements, Philips has evaluated the remedial activities performed at the site to determine if the selected cleanup plans are working. The results were submitted in a report titled "Five-Year Status Report and Effectiveness Evaluation", dated October 9, 1996.

The AMD site is located at 1165 E. Arques Avenue, south of Highway 101 in Sunnyvale. The site is located near the National Semiconductor (NSC) Superfund site at 2900 Semiconductor Drive in Santa Clara. The AMD and NSC Superfund sites and the impacted areas north of the sites are collectively referred to as Operable Unit 1. Operable Unit 1 has been divided into 3 subunits. Subunit 1 consists of the NSC site, a former UTC site, and the area generally extending to East Arques Avenue. Subunit 2 consists of the AMD site. Subunit 3 consists of the area downgradient (north) of subunits 1 and 2. NSC is responsible for addressing contamination in subunit 1; AMD and NSC are jointly responsible for addressing contamination in subunit 2 and subunit 3.

Investigations were initiated at the AMD site (subunit 2) in 1982. The investigations indicated that soil and groundwater were impacted with VOCs (primarily TCE, PCE, DCE) and PNAs. The sources of contamination were solvent tanks and acid waste neutralization systems. The solvent tanks and acid neutralization systems were removed from the site between 1983 and 1985. A soil vapor extraction system (SVE) was installed in 1993.

VOCs in the groundwater beneath subunit 2 are limited to the A, B1, and B2 aquifers, and have not impacted deeper aquifers used for public water supply. In 1986, AMD began extracting groundwater at subunit 2. Currently, the groundwater remediation system consists of 12 groundwater extraction wells. Extracted groundwater is treated and discharged to the surface water under NPDES permit.

Remediation of commingled groundwater contamination from the AMD and NSC sites in subunit 3 was initiated in 1990, and expanded in 1992. The current subunit 3 groundwater remediation consists of 3 extraction wells and a large dewatering system in the A and B1 aquifers. The extraction wells and system are located near the northern extent of the VOC plume near Highway 101 and Lawrence Expressway. Groundwater extracted in subunit 3 is discharged to surface waters under NPDES permit.

Located to the west of Operable Unit 1 is the Stewart Drive Operable Unit (formerly referred to as Operable Unit 2). The Stewart Drive Operable Unit includes the 999 Arques Corporation, the Inprint/Sobrato Development, and the CAE Electronics sites. Additional investigations in the Operable Units indicate that although there is some commingling at the Operable Units' common boundary, the most significant groundwater contamination is largely limited to the area of each respective operable unit. Therefore, cleanup of each operable unit is pursued independently.

II. Discussion of Remedial Objectives. The remedial plan was developed using the nine evaluation criteria defined by CERCLA requirements and considerations. The selected remedy was groundwater extraction and treatment, soil excavation, and soil vapor extraction. This is the most cost effective technology available and is protective of human health and the environment. The soil cleanup standard for vadose zone soil is 1 ppm for VOCs, and 10 ppm for PNAs. Groundwater cleanup standards are based on USEPA MCLs.

II. ARARs Review. ARARs have not changed for the chemicals of concern.

IV. Effectiveness Evaluation. AMD has spent approximately \$1.1 million over the last five years on remediation and monitoring in subunit 2. Approximately 390 pounds of VOCs has been removed from vadose zone soil with the SVE system. Although the system was not designed to remediate polynuclear aromatics (PNAs), PNAs have generally have declined to levels below cleanup standards. In addition, confirmation soil sampling indicates low to non-detectable levels of residual VOC concentrations, and VOC removal efficiencies have declined significantly. Based on the reduced soil contamination levels and declining SVE efficiencies, AMD is proposing to curtail SVE operations.

A summary of AMD's groundwater remediation performance for subunit 2 from 1991-1995 is summarized in Table 1. A summary is also included for subunits 1 and 3. The effectiveness of groundwater extraction largely depends on the permeability of the soil matrix, the quantity of VOCs sorbed to the soil matrix, and the rate of VOC transfer from soil matrix to groundwater. The slowly decreasing mass removal rate and the relatively

stable VOC plume configuration and concentrations despite extraction of significant volumes of groundwater indicate that large quantities of VOCs may be bound to soil matrix and may have diffused into low permeability soil matrix which contains relatively immobile groundwater. The rate of VOC transport from low permeability media is an extremely slow process. Therefore, while the groundwater extraction system has provided source control and some reduction in chemical concentrations, groundwater extraction has not resulted in any significant retraction of the overall extent of the plume.

Extraction efficiency is averaged over the 1991-1995 year period. Generally there has been a decline in removal efficiencies as cleanup progresses.

Table 1 - Groundwater Extraction Summary for 1991-1995 Period

| Subunit | Volume of Extracted Groundwater (million gallons) | VOC Mass Removal (lbs) | Average Efficiency (lbs/m.gal) |
|-----------|---|------------------------|--------------------------------|
| Subunit 1 | 398 | 2466 | 6.2 |
| Subunit 2 | 69 | 349 | 5.0 |
| Subunit 3 | 109 | 261 | 2.4 |
| Total | 576 | 3076 | average: 4.5 |

V. Summary of Site Visit. Regional Board staff inspected the site most recently in July 1994. The remediation systems were operating properly.

VI. Areas of Noncompliance. The discharger has fully implemented the approved remedial action, consistent with the remedial objectives, and is in compliance.

VII. Recommendations. At this time, the discharger should continue implementation of the approved remedial actions. At present no remedial technologies have been identified that would significantly improve the effectiveness of the implemented remedies. Staff need to determine whether it would be appropriate to curtail operation of the soil vapor extraction system.

VIII. Statement of Protectiveness

I certify that the remedy selected for this site remains protective of human health and the environment.

IX. Next Five-Year Review

The next five-year review will be conducted by September 18, 2001.

Keith Takata, Director
Superfund Division, Region IX